

OC-33: A Pilot Scale Sonochemical Coating Process F or The Production Of Antibacterial Fabrics

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As many as 1 in 10 patients who visit European hospitals each year contract hospital acquired infections (HAIs). These infections cost our healthcare systems many billions of Euros and in some cases lead to deaths. Textile items such as laboratory coats, bed sheets and curtains, are some of the main routes by which HAIs are spread. Antibacterial textiles can reduce the incidence of HAIs by killing bacteria rather than helping them to spread. For wide scale use in hospitals antibacterial textiles need to be low cost, highly durable, active against a wide range of bacteria and non-harmful to humans and the environment. The aim of this project is to develop a pilot scale process for the production of antibacterial textiles that meet these requirements.

The technology under development is based on a sonochemical coating procedure that was developed by researchers at Bar-Ilan University, Israel (Abramov et al. 2009). It involves two processes that are driven by acoustic cavitation; the generation of antibacterial metal oxide nanoparticles (NPs), and the simultaneous propulsion of these NPs at high velocity on to the surface of the fabrics leading to impregnation. Here we describe the basic sonochemical coating procedure together with some results from antibacterial efficacy testing work carried out at Coventry University.

In order to determine the best technology for scaling up of the process, two pilot scale coating machines have been constructed. One machine based on piezoelectric transducers has been manufactured by Cedrat (France), and installed at a textile company in Italy (Klopman International Ltd). Another based on magnetostrictive transducers has been manufactured by Viatech (Russia), and installed at a textile company in Romania (Davo Star Impex SRL). In order to ensure that the textiles produced are suitable for their intended use, samples of the coated fabrics are being tested for antibacterial activity against a range of bacteria associated with HAIs. This antibacterial efficacy testing is being carried out according to the absorption method from international standard BS EN ISO 20743:2007.

Here we report some results from the testing of samples of cotton coated with CuO NPs using both of the pilot scale machines. The antibacterial tests were done with two species of bacteria; methicillin-resistant *Staphylococcus aureus* (MRSA) and *Acinetobacter baumannii*. The results for the CuO coated cotton from both of the machines show a high level of antibacterial activity against both species of bacteria. These results indicate that at this stage the pilot scale machines successfully produce the same antibacterial coating as that produced with the lab scale device.

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References

Abramov, O.V., Gedanken, O., Kolytin, Y, Perkas, N., Perelshtein, I., Joyce, E. and Mason, T.J., 2009, Pilot scale sonochemical coating of nanoparticles onto textiles to produce biocidal fabrics, *Surface and Coatings Technology* 204, 718-722